REMARKS

Reconsideration of this application, as amended, is respectfully requested.

THE CLAIMS

Each of independent claims 1, 14, 18, 19 and 20 has been amended to clarify that the pre-chirp compensator is disposed on the optical path such that the pulse laser beam passes therethrough, and that the pre-chirp compensator is <u>preset</u> to provide the pulse laser beam with a certain amount of pre-chirp compensation, as supported by the disclosure in the specification in the paragraph bridging pages 10-11 and in the paragraph bridging pages 17-18.

In addition, each of independent claims 1, 14, 18, 19 and 20 has been amended to clarify that the pre-chirp compensator comprises optical elements which cause components of the pulse laser beam to be emitted in order of wavelength such that shorter wavelengths are emitted earlier than longer wavelengths, as supported by the disclosure in the specification in the paragraph bridging pages 17-18.

No new matter has been added, and it is respectfully requested that the amendments to the claims be approved and entered.

THE PRIOR ART REJECTION

Claims 1-3, 5-7, and 10-21 were (again) all rejected under 35 USC 103 as being obvious in view of various combinations of

USP 5,862,287 ("Stock et al"), the G.J. Brakenhoff et al publication cited by the Applicant ("Brakenhoff et al"), USP 5,034,613 ("Denk et al") and/or USP 6,169,289 ("White et al). These rejections, however, are (again) respectfully traversed.

According to the present invention as recited in each of amended independent claims 1, 14, 18, 19 and 20, the pre-chirp compensator comprises optical elements which cause components of the pulse laser beam to be emitted in order of wavelength such that shorter wavelengths are emitted earlier than longer wavelengths. In other words, the pre-chirp compensator of the claimed present invention is preset to provide a negative amount of pre-chirp compensation.

In order to provide a laser beam with a positive chirp, a structure employing only an optical element having a certain length can be used as a pre-chirp compensator. On the other hand, in order to provide a laser beam with a negative chirp, it is necessary to use a complicated structure, such as the prism combination structure shown in Fig. 6 of the present application. And with the prism-combination structure, adjusting the amount of pre-chirp compensation entails changing the positions of the prisms. This causes a shift in the optical axis, thereby making the adjusting operation difficult.

Thus, according to the structure of the present invention as recited in amended claims 1, 14, 18, 19 and 20, the pre-chirp compensator is <u>preset</u> (i.e., fixedly set in advance) to provide a certain amount of pre-chirp compensation (i.e., to have a constant set value). And it is respectfully pointed out that, in

contrast to the Examiner's assertion at page 4, lines 9-10 of the Office Action, this is not an interactive control.

As explained in detail in the Amendment filed January 28, 2002, with the structure of the claimed present invention, when the objective lenses or optical member is switched, only adjustment of the optical correcting section, e.g., switching of optical correcting elements, is performed to cause the optical path length from the laser beam source to the sample to be constant. With this arrangement, even when the objective lenses or optical member is switched, the sample is irradiated with the pulse laser beam with an optimum pulse width, without changing the set value of the pre-chirp compensator.

It is noted that the present invention has been achieved to overcome the problems arising in conventional multiphoton excitation scanning laser microscopes, in which a pre-chirp compensator providing a negative chirp is used along with a plurality of optical elements, such as objective lenses, having different optical path lengths. Specifically, switching of the optical elements disturbs an ideal condition in which a sample is irradiated with a pulse laser beam with an optimum pulse width. On the other hand, it is difficult to adjust the pre-chirp compensator to recover this, especially during observation operations, due to the complicated structure of the conventional pre-chirp compensator.

The cited references are the same references cited in the previous Office Action, and it is respectfully submitted that the cited references do not address the above mentioned problems

arising in conventional multiphoton excitation scanning laser microscopes and that there would have been no motivation to combine the teachings of the cited references to achieve the structure of the present invention as recited in each of amended independent claims 1, 14, 18, 19 and 20.

In particular, it is noted that Brakenhoff et al discloses merely a technique of using a pre-chirp compensator for a laser beam, and that Stock et al merely discloses a technique of adding an optical member to a shorter optical path, where two optical paths (optical fibers) have different lengths, so that the two optical paths may have the same length. In addition, it is noted that Denk et al and White et al merely disclose multiphoton excitation.

None of the cited references, however, discloses, teaches of suggests the features of the present invention whereby the pre-chirp compensator is <u>preset</u> to provide a pulse laser beam with a certain amount of pre-chirp compensation, and whereby the pre-chirp compensator comprises optical elements which cause components of the pulse laser beam to be emitted in order of wavelength such that shorter wavelengths are emitted earlier than longer wavelengths.

Accordingly, it is respectfully submitted that even if the cited references were combinable in the manner suggested by the Examiner, the above described structural features and advantageous effects of the present invention as recited in amended independent claims 1, 14, 18, 19 and 20 would still not be achieved or rendered obvious.

In view of the foregoing, it is respectfully submitted that the present invention as recited in each of amended independent claims 1, 14, 18, 19 and 20, as well as each of claims 2-3, 5-7, 10-13, 15-17 and 21 respectively depending therefrom, patentably distinguishes over the cited references, taken singly or in combination, under 35 USC 103.

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Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claims 1, 14, 18, 19 and 20 have been amended as follows:

1. (Second Amended) A multiphoton excitation scanning laser microscope, comprising:

(a) a station for placing a sample to be observed;

(b) a laser beam source for emitting a pulse laser beam for exciting said sample to cause the sample to emit a fluorescent light by multiphoton excitation phenomenon;

(c) a detector for detecting said fluorescent light; and

(d) an optical system for forming an optical path of said pulse laser beam for guiding said pulse laser beam from said laser beam source to said sample, said optical system including:

a pre-chirp compensator [arranged] <u>disposed</u> on said optical path [for providing] <u>such that the pulse laser beam passes therethrough, and preset to provide</u> said pulse laser beam with a certain amount of pre-chirp compensation, <u>said pre-chirp compensator comprising optical elements which cause components of the pulse laser beam to be emitted in order of wavelength such that shorter wavelengths are emitted earlier than longer wavelengths,</u>

a plurality of objective lenses adapted to be selectively placed on said optical path for collecting the pulse laser beam on the sample, and

a correcting mechanism for correcting an optical path length of said optical path so as to be constant no matter which

of said objective lenses is selectively placed on said optical path,

wherein said correcting mechanism comprises at least one optical correcting element adapted to be selectively placed on said optical path in accordance with which of said objective lenses is selectively placed on said optical path, and

wherein said certain amount of pre-chirp compensation provided by said pre-chirp compensator is set to prevent a pulse width of said pulse laser beam from widening due to a wavelength range of a pulse of said pulse laser beam when said pulse laser beam passes through said optical path whose optical path length is kept constant.

14. (Second Amended) A multiphoton excitation scanning laser microscope, comprising:

(a) a station for placing a sample to be observed;

(b) a laser beam source for emitting a pulse laser beam for exciting said sample to cause the sample to emit a fluorescent light by multiphoton excitation phenomenon;

(c) a detector for detecting said fluorescent light; and

(d) an optical system for forming an optical path of said pulse laser beam for guiding said pulse laser beam from said laser beam source to said sample, said optical system including:

a pre-chirp compensator [arranged] <u>disposed</u> on said optical path [for providing] <u>such that the pulse laser beam passes therethrough, and preset to provide</u> said pulse laser beam with a certain amount of pre-chirp compensation, <u>said pre-chirp</u>

compensator comprising optical elements which cause components of the pulse laser beam to be emitted in order of wavelength such that shorter wavelengths are emitted earlier than longer wavelengths,

an optical member adapted to be selectively placed on said optical path, and

a correcting mechanism for correcting an optical path length of said optical path so as to be constant,

wherein said correcting mechanism comprises at least one optical correcting element adapted to be selectively placed on said optical path in accordance with selective placement of said optical member, and

wherein said certain amount of pre-chirp compensation provided by said pre-chirp compensator is set to prevent a pulse width of said pulse laser beam from widening due to a wavelength range of a pulse of said pulse laser beam when said pulse laser beam passes through said optical path whose optical path length is kept constant.

18. (Amended) A multiphoton excitation scanning laser microscope, comprising:

(a) a station for placing a sample to be observed;

(b) a laser beam source for emitting a pulse laser beam for exciting said sample to cause the sample to emit a fluorescent light by multiphoton excitation phenomenon;

(c) a detector for detecting said fluorescent light; and

(d) an optical system for forming an optical path of said pulse laser beam for guiding said pulse laser beam from said laser beam source to said sample, said optical system including:

a pre-chirp compensator [arranged] disposed on said optical path [for providing] such that the pulse laser beam passes therethrough, and preset to provide said pulse laser beam with a certain amount of pre-chirp compensation, said pre-chirp compensator comprising optical elements which cause components of the pulse laser beam to be emitted in order of wavelength such that shorter wavelengths are emitted earlier than longer wavelengths,

a plurality of objective lenses adapted to be selectively placed on said optical path for collecting the pulse laser beam on the sample, and

a correcting mechanism for causing an optical path length of said optical path to be constant no matter which of said objective lenses is selectively placed on said optical path,

wherein said correcting mechanism comprises an optical correcting element whose optical path length is adjustable by applying different voltages in accordance with which of said objective lenses is selectively placed on said optical path, and

wherein said certain amount of pre-chirp compensation provided by said pre-chirp compensator is set to prevent a pulse width of said pulse laser beam from widening due to a wavelength range of a pulse of said pulse laser beam when said pulse laser beam passes through said optical path whose optical path length is kept constant.

19. (Amended) A multiphoton excitation scanning laser microscope, comprising:

(a) a station for placing a sample to be observed;

(b) a laser beam source for emitting a pulse laser beam for exciting said sample to cause the sample to emit a fluorescent light by multiphoton excitation phenomenon;

(c) a detector for detecting said fluorescent light; and

(d) an optical system for forming an optical path of said pulse laser beam for guiding said pulse laser beam from said laser beam source to said sample, said optical system including:

a pre-chirp compensator [arranged] disposed on said optical path [for providing] such that the pulse laser beam passes therethrough, and preset to provide said pulse laser beam with a certain amount of pre-chirp compensation, said pre-chirp compensator comprising optical elements which cause components of the pulse laser beam to be emitted in order of wavelength such that shorter wavelengths are emitted earlier than longer wavelengths,

a plurality of objective lenses adapted to be selectively placed on said optical path for collecting the pulse laser beam on the sample, and

a correcting mechanism for causing an optical path length of said optical path to be constant no matter which of said objective lenses is selectively placed on said optical path,

wherein said correcting mechanism comprises an optical correcting element whose optical path length is adjustable by

applying different pressures in accordance with which of said objective lenses is selectively placed on said optical path, and

wherein said certain amount of pre-chirp compensation provided by said pre-chirp compensator is set to prevent a pulse width of said pulse laser beam from widening due to a wavelength range of a pulse of said pulse laser beam when said pulse laser beam passes through said optical path whose optical path length is kept constant.

20. (Amended) A multiphoton excitation scanning laser microscope, comprising:

(a) a station for placing a sample to be observed;

(b) a laser beam source for emitting a pulse laser beam for exciting said sample to cause the sample to emit a fluorescent light by multiphoton excitation phenomenon;

(c) a detector for detecting said fluorescent light; and

(d) an optical system for forming an optical path of said pulse laser beam for guiding said pulse laser beam from said laser beam source to said sample, said optical system including:

a pre-chirp compensator [arranged] disposed on said optical path [for providing] such that the pulse laser beam passes therethrough, and preset to provide said pulse laser beam with a certain amount of pre-chirp compensation, said pre-chirp compensator comprising optical elements which cause components of the pulse laser beam to be emitted in order of wavelength such that shorter wavelengths are emitted earlier than longer wavelengths,

a plurality of objective lenses adapted to be selectively placed on said optical path for collecting the pulse laser beam on the sample, and

a correcting mechanism for causing an optical path length of said optical path to be constant no matter which of said objective lenses is selectively placed on said optical path, and

wherein said certain amount of pre-chirp compensation provided by said pre-chirp compensator is set to prevent a pulse width of said pulse laser beam from widening due to a wavelength range of a pulse of said pulse laser beam when said pulse laser beam passes through said optical path whose optical path length is kept constant.